Mitsuko SUGIYAMA*: **Comparative studies of the vascular system of node-leaf continuum in woody Ranales II.** Node-leaf vascular system of *Eupomatia laurina* R. Br.**

杉山明子*: 原始被子植物の維管束系 II.** *Eupomatia laurina* R. Br. の維管束系について

Introduction The family Eupomatiaceae, which occurs in the eastern part of Australia and New Guinea, is considered to be a group of primitive living angiosperms. *Eupomatia laurina* was first discovered by R. Brown (1814), and was classified as a member of the Annonaceae. Baillon (1868–1870) studied the genus and pointed out its aberrancy based on the absence of a perianth, the presence of a calyptra and the formation of a concave receptacle. Later, Diels (1912) treated the genus *Eupomatia* apart from the Annonaceae and established a new independent family, Eupomatiaceae.

In support of a change based on Diels' treatment, Engler (1919) and Hutchinson (1926) gave the Eupomatiaceae a place close to the Annonaceae. However, Garratt (1933), Lemesle (1936) and Ozenda (1949) pointed out the anatomical differences between the two families and suggested that the affinity between them was somewhat distant.

In the present paper, a detailed investigation of the node-leaf vascular system of *Eupomatia laurina* is described.

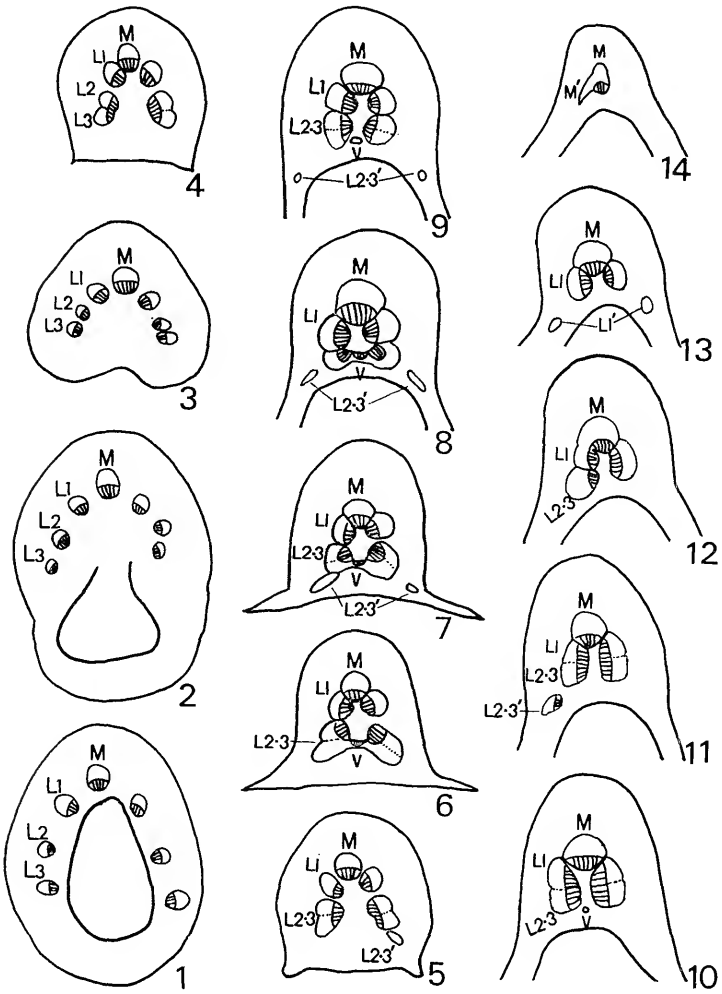
Materials and methods *Eupomatia laurina* is one of the two species in the family and has the wider range of distribution. The plant is an evergreen tree, up to 15 m high, with entire, pinnately veined and exstipulate leaves. The solitary flowers are terminated on short axillary shoots.

Young shoots with two or three unfolding leaves were obtained from the Royal Botanical Gardens and National Herbarium, South Yarra, Victoria, Australia in 1974.

The materials were fixed and preserved in FAA and treated in the same

* Botanical Gardens, Koishikawa, Faculty of Science, University of Tokyo. Hakusan, Bunkyo-ku, Tokyo. 東京大学理学部附属植物園系統・分類学研究室.

** Continued from the Botanical Magazine Tokyo, 89(1013): 33-43.



Figs. 1-14. Successive levels of transectional view in leaf-node continuum of *Eupomatia laurina* R. Br. Figs. 1-2. Node and the level of its transition to petiole. Figs. 3-4. Petiolar levels. Figs. 5-8. Lower portion of lamina. Figs. 9-12. Medial portion of lamina. Figs. 13-14. Upper portion of lamina. M: median leaf trace. L1, L2, L3 and L2·3: lateral leaf traces in midrib. L1' and L2·3': bifurcated veinlets from lateral leaf traces. V: ventral trace. 1-5. ×ca 12. 6-8. ×ca 15. 9-13. ×ca 21. 14. ×ca 30.

way as described in the previous paper (Sugiyama, 1972).

Observation At the node of the young shoot of *Eupomatia laurina*, seven traces depart from the axial stele leaving a corresponding number of gaps (Fig. 1). All the traces enter the petiolar base as foliar traces (Figs. 2-3). Thus, at the petiolar base the leaf traces are distinguishable as a single median trace (M) and three pairs of lateral traces (L1, L2 and L3), being symmetrically arranged on the two sides (Fig. 3). Midway along the short petiole, marginal lateral traces L2 and L3 become fused to a single lateral trace L2•3 on each side. Consequently, the cross-sectional view of this level exhibits only two pairs of laterals (L1 and L2•3) on each side of the median trace (Fig. 4). At the very base of the lamina a small bundle (L2•3') diverges from each fused marginal lateral trace (L2•3) and enters an inconspicuous petiolar wing (Fig. 5). In the level slightly above the laminar base, the traces L2•3 on both sides are laterally divided to give rise to bundles. These bundles are inversely oriented, eventually transferred and finally fused to form a single ventral trace (V). Thus an entire vascular ring is formed by trace M, two pairs of lateral traces (L1 and L2•3) and the ventral trace (V) (Fig. 6). In the lower level of the lamina, vascularization of secondary veins is supplied with divergent traces from marginal traces L2•3 giving rise to traces L2•3' successively (Figs. 7-8).

At the level of one-third of the laminar length from the base, the ventral trace (V) gradually decreases in size and finally disappears from the vascular ring in the midrib (Figs. 9-11). Consequently, a U-shaped vascular bundle is formed in the midrib. At this level the two pairs of lateral traces (L1 and L2•3) come to adhere closely each other and from a large lateral bundle, still retaining their original elements (Fig. 10).

Above the mid-level of the lamina, the remainders of traces L2•3 depart from the U-shaped vascular bundle in the midrib to the secondary laminar vascularization and eventually disappear (Figs. 12-13). Thus the trace M and a pair of traces L1 are observed in the midrib. The traces L1 bifurcate to give rise to traces L1' laterally for the secondary venation (Fig. 13). Likewise, in the upper level, the secondary laminar vascularization is successively supplied with branchlets of traces L1. The traces (L1) gradually decrease in size and eventually reduce in the midrib. Trace M then begins to diverge laterally on both sides to give rise to the uppermost secondary

veins for the uppermost portion of the lamina (Fig. 14).

Discussion Ozenda (1949) and Benzing (1967) observed a 7-trace, 7-lacunar condition in the node of *Eupomatia*. However, Eames (1961) reported the occurrence of leaf traces varying in the number from seven to eleven. He described this without illustration. Judging from these previous reports and including my own observation, the 7-trace, 7-lacunar condition seems to be the most probable and common nodal type in *Eupomatia laurina*. Additions and reductions of the number of lateral traces are frequently observed in plants with multilacunar node (Sugiyama, 1976). Therefore, it may be possible to find the 11-trace condition in *Eupomatia*.

In phylogenetical considerations concerning magnolean allies, the number of the lacunae and traces at the node appears to be less significant than the behavior of traces in the node-leaf continuum, as has been observed by the author (Sugiyama, 1976).

In the course of comparative studies on the behavior of leaf traces in the node-leaf continuum, different types of ventral origin have observed in Magnoliales. In the Magnoliaceae, the ventral trace is generally derived from either lateral branches of the median trace (M) and/or a pair of lateral traces closest to the median (M) (Ozenda, 1949; Sugiyama, 1972, 1974). In *Eupomatia*, however, the ventral trace (V) is observed to originate from the lateral branches of the marginally located lateral traces (L2•3).

Further comparative studies are necessary in order to discuss the phylogenetical significance of the behavior of leaf traces in the node-leaf continuum.

Acknowledgments The materials for this paper were collected at the Royal Botanical Gardens and National Herbarium, South Yarra, Vic., Australia. For aid in collecting I would like to thank Dr. D. M. Churchill, Director and Government Botanist, and Dr. M. Wada, Department of Botany, University of Tokyo. My sincere gratitude is also due to Prof. T. Yamazaki, The Botanical Gardens, University of Tokyo, for his valuable advice and criticism.

References

Baillon, H. (1868-1870): Recherches organogéniques sur les *Eupomatia*. Adansonia Rec. Observ. Bot. 9: 22-29 (not seen). Benzing, D. H. (1967):

Developmental patterns in stem primary xylem of woody Ranales II. Species with trilacunar and multilacunar nodes. Amer. J. Bot. **54**: 813-820. Brown, R. (1814): General remarks, geographical and systematical on the botany of Terra Australis. Appendix II. **2**: 597 (not seen). Diels, L. (1912): Über primitive Ranales der Australischen Flora. Engler Bot. Jb. **48**: 7-14. Eames, A. J. (1916): Morphology of the Angiosperms. N. Y. pp. 429-432. Engler, A. and E. Gilg (1919): Syl. Pflanzenf. p. 197. Garratt, G. A. (1933): Bearing of wood anatomy on the relationships of the Myristicaceae. Trop. Woods **36**: 20-44. Hotchkiss, A. T. (1955): Geographical distribution of the Eupomatiaceae. J. Arnold Arb. **36**: 385-396. —— (1958): Pollen and pollination in the Eupomatiaceae. Proc. Linn. Soc. NSW **83**: 86-91. Hutchinson, J. (1926). Families of Flowering Plants. Dicotyledons. London. p. 88. Lemesle, R. (1936): Les vaisseaux à perforationes scalariformes de l'*Eupomatia* et leur importance dans la phylogénie des Polycarpes. C. R. Acad. Sci. Paris. **203**: 1538-1540. —— (1938): Contribution a l'étude du genre *Eupomatia* R. Br. Rev. Gen. Bot. **50**: 693-714. Lemesle, R. (1955): Contribution a l'étude de quelques familles de Dicotyledons consideres commes primitives. Phytomorph. **5**: 11-45. Ozenda, P. (1949): Recherches sur les Dicotylédones apocarpiques. Paris. pp. 107-109. Sugiyama, M. (1972): A vascular system of "node to leaf" in *Magnolia virginiana* L. J. Jap. Bot. **47**: 313-320. —— (1974): A vascular system of "node to leaf" in *Michelia champaca* L. ibid. **49**: 250-256. —— (1976): Comparative studies of the vascular system of node-leaf continuum in woody Ranales I. Diversity in successive nodes of first-year plants of *Magnolia virginiana* L. Bot. Mag. Tokyo **89**(1013): 33-43.

* * * *

Eupomatia laurina の維管束の走行とその行動について節から葉身の先端まで追跡した。節では7葉跡，7葉隙性を示し，葉柄で7本の維管束は中央脈 M とこれに左右対称に位置する3対の葉脈 (L1, L2, L3) に区別される。葉柄の上部で，側脈のうち L2 と L3 はゆ合し，一本の太い側脈 L2•3 をつくる。これより上方，葉身の基部では L2•3 からの分枝が向軸がわへ移行し，腹脈 V を形成，ここで中央脈 M, 2 対の側脈 (L1, L2•3) と腹脈 V から成る維管束環が形成される。

葉身の基部では，外縁に位置する1対の側脈 L2•3 から二次脈として L2•3' が分枝する。葉身基部から三分の一ほど上方で，腹脈 V は次第に細くなり，二次脈を分枝す

ることもなく消失する。続いて側脈 L2•3 も幾度か L2•3' の分枝を繰返しながら細くなり，遂には二次脈となって中肋から消失する。葉身の上方では，維管束は腹脈 V の消失によって U 字型となる。また L2•3 が消失したので，葉身上部から先端にかけては，側脈 L1 が二次脈 L1' を分枝し，葉の先端部に近づくにつれて，L1 は全て二次脈として葉身へでていく。この結果，葉の先端部では中央脈 M のみが中肋にとどまっている。そしてこれが葉の最先端に至るまで細い二次脈 M' を分枝する。

Eupomatia で観察された腹脈は，これまで報告したモクレン科のものと由来が異なることが注目される。*Magnolia virginiana* や *Michelica champaca* における腹脈は，中央脈から分枝した m と，更に中央脈の両隣りに近接する側脈に由来するものであった。しかしながら *Eupomatia laurina* では腹脈は中肋で維管束環をつくる側脈のうち最外縁に位置する L2•3 からの分枝が単に向軸がわへ移行したものである。

これら由来の異なる腹脈における系統学上の意義を解明するためには，更に近縁群の間での比較が必要である。

□林　義雄：**京の野菜記**　pp. 174 ナカニシヤ出版，京都 (1975, X 1) ¥980。京都は都として長い歴史を持ちつづけた処であり，多くの伝統を残した処でもある。野菜についても同様であった。それが近来の急激な発展と変貌で消滅しかかっているものが多いのをみて，著者は府の農業指導の傍，産地を廻り古老にたずね文献を漁ってこの書を作られた。適当に図，地図を加え，失われてゆくのを惜しみながら，その発達と変還，移動の具合から民俗にまで及んでいて，その筆跡は中々興味がつきない。すぐき，壬生菜，聖護院かぶのようなよく知られたものから，えびいも，うきなかぶ，郡大根のような絶滅したもの迄扱っている。このように失われて行くものの記録と，保存の対策について考えさせられる本である。　(前川文夫)

□矢野　勇：**野菜の花**　pp. 162, pls. 78, 朝日ソノラマ, 東京 (1975, V.), ¥1,500。朝日新聞の家庭欄に連載されたものを中心にして，写真を全図カラーに置きかえたもの，写真と説明が 2 ページ毎に入れかわっている。軽妙な筆致もさることながら，カラー写真がまことによくとれていて，印刷と相俟ってまことに気持よく見られる。その上に，シヨウガ，ツリートマトの花など，専門家にもめずらしいし，十種に近いマメ科の花など，蝶形花冠だと簡単に思いがちだが，まことに多種多様でその意外さにおどろく。アポノゲトンの花が食用になって美味だなどもはじめて知った。カットの植物画が存外きいている。野菜は普通には根，茎，葉，及び果実のどれかを食用にするので，存外花はその中間で見落されているから，その盲点をねらったものといえる。一冊を備えて置く必要のある本と思う。　(前川文夫)